



Central States Center for Agricultural Safety and Health

Annual Report

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University of Nebraska Medical Center, College of Public Health

Section I

Center Summary

The Central States Center for Agricultural Safety and Health (CS-CASH) was funded as one of nine NIOSH agricultural health and safety centers, starting September 2011. CS-CASH is based out of the University of Nebraska Medical Center, College of Public Health in Omaha, Nebraska. The Center serves seven states in the central United States: North Dakota, South Dakota, Nebraska, Kansas, Minnesota, Iowa, and Missouri. CS-CASH is a partnership where public health, agricultural, and grass roots organizations utilize their strengths and regional presence to contribute to a common goal: reducing injury and illness in agriculture. We envision a vibrant agricultural sector in our region and the United States where health and safety is highly valued and work-related injuries and illnesses are rare. Our mission is to work with the agricultural community in the Central States and beyond, conducting research, interventions, education, and outreach activities, with the aim of discovering the mechanisms of injury and illness, and developing, implementing, and evaluating prevention strategies that measurably improve the health and safety of members of the agricultural community.

Relevance

CS-CASH aims to improve the safety and health of farmers, ranchers, agricultural workers, and their families. The Center conducts research and translates findings into practical applications. Research teams from different states and institutions bring expertise and access to farm audiences in the Center's region. With strong public health-agriculture-grassroots partnerships we can address local, regional and national issues. The Center's research projects focus on injury prevention and surveillance, respiratory disorders, hearing loss, education, vulnerable workers, mental health and sleep deprivation. Information is disseminated through agricultural shows and events, school programs, courses, presentations, articles, and messages in electronic and printed media.

Key Personnel

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Safety and Health Education for Non-Traditional Farm Families Shari Burgus PI



Existing agricultural safety and health materials were pilot tested at farm shows and via email surveys. Results from this testing will be used to develop relevant resources for each demographic group.

Changing farm demographics influence hazard exposure, prevention tactics, communication channel choices, and resource preferences. This project seeks information from traditional, retired, residential/lifestyle, and organic farmers to identify the differences and similarities in information needs. In the first year of the project, three data collection methods were used to collect data in the CS-CASH seven-state region: National Agricultural Statistics Service administered a survey to 1,038 farmers; face-to-face interviews were completed with 511 farm family members; and five focus groups were conducted.

In the second year of the project, data collected from each method were compiled and compared to identify the differences and similarities among the various farm groups. Mailed survey respondents identified a total of 38 farm hazards, including machine/equipment. While 27% of organic farmers required safety information for one or more hazards, only 7% of retired and residential farmers required this information. The top perceived hazards and need for safety information were power take off hazards, lawn mowers, tractors, machine shops, storage structures, confined spaces, animal handling, pesticide exposure, lifting heavy objects, hearing loss, musculoskeletal problems, respiratory disorders, and stress. Farm size and operator demographics were significant predictors of hazard perception and safety information needs among farmers in the Central States region.

In the third year of the project, topics and existing educational resources identified in the data collection process were pilot tested using mail surveys to farmers and interviews at farm shows in the CS-CASH region. Results of the surveys are being analyzed. This information will be used to develop relevant resources for each group, be pilot tested with each farmer group, and adapted upon results.



The long term goal of this CS-CASH research project is to gain a better understanding of agricultural related lung diseases and how these diseases can be treated more effectively.

ADMA: A Novel Pathway in Organic Dust-mediated Allergic and Non-allergic Asthma

Organic dust exposure, like that experienced by agricultural workers in confined animal feeding operations, is known to cause inflammation in some workers. Our studies are beginning to unveil how and why this occurs. Our long-term goal is to understand why some people exposed to confined animal dusts have more severe diseases of the lung and to examine the impact of combination exposures in the workplace when dust-exposed workers both smoke and drink alcohol.

We based our studies on earlier publications, by us and others, demonstrating that the endogenous nitric oxide synthase (NOS) inhibitor asymmetric dimethylarginine (ADMA) potentiates allergic inflammation and decreases pulmonary function. Lung and circulating ADMA levels are increased in allergic asthma models, although the mechanisms involved remain unclear. Expression of the enzyme that metabolizes ADMA, dimethylarginine dimethylaminohydrolase (DDAH), is significantly reduced in murine models of allergic and non-allergic inflammation, suggesting a mechanism for elevated ADMA.

For this project, our studies have now established that airway epithelial PKA activation requires the functional production of nitric oxide. Furthermore, we found that enhancing the nitric oxide pathway by over-expressing a nitric oxide protective enzyme (DDAH) was protective against organic dust-stimulated PKC activity and inflammation in a mouse model. To further investigate the mechanisms of this pathway, we have recently found the following:

- Agents that enhance nitric oxide production decrease swine barn dust induced lung inflammation
- DDAH overexpression blocks endogenous nitric oxide synthesis inhibitors and is protective against swine barn dust-induced lung inflammation
- PKA activation results in the attenuation of tumor necrosis factor (TNF) converting enzyme activity, leading to the inhibition of swine barn dust-induced TNF alpha production in airway epithelium

Going forward, we will continue to explore bi-directional control of PKA and PKC in the context of nitric oxide production and manipulation and how that relates to dust-mediated pulmonary inflammation. We will also continue to include real-world co-exposures, cigarette smoke and alcohol consumption in our animal studies.

Surveillance of Agricultural Injuries in the Central States Region Risto Rautiainen PI

The objective of this project is to improve the surveillance of injuries in agriculture by developing an innovative, cost-effective surveillance system using a combination of existing data sources. CS-CASH collaborates with the National Agricultural Statistics Service (NASS) to accomplish two specific aims: 1) to implement an annual injury survey, linked with existing data from the Census of Agriculture, and 2) to describe injuries, injured persons, rates of injury, and risk factors for injury.

Three rounds of data collection have been completed. The response rates have ranged from 33 to 37% of farms. The majority of the operators have been male (84%), and the majority spent more than half of their time working on a farm or ranch (52%). The incidence of injuries among farm operators (principal operator and up to two other operators per farm) was 7.64% in 2011, 7.44 in 2012 and 6.11 in 2013. The average direct out-of-pocket cost of injury has ranged from \$1712 to \$3495, and the average cost covered by insurance has ranged from \$7085 to \$7723. More than half of injuries (56%) required professional medical care, 9% resulted in hospitalization, and most injured operators lost work time ranging from less than half a day to 30 days or more. Frequently the injuries were sustained when working with machinery or livestock.

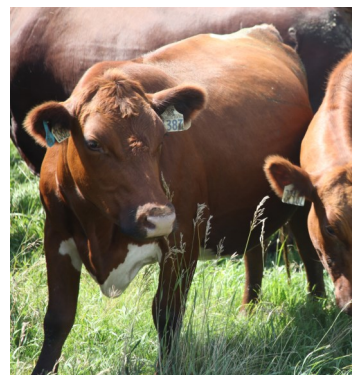
The injury surveillance also involves tracking injury cases through a press clipping service. In 2013, this system found 86 fatal (92 in 2012) and 92 non-fatal (102 in 2012) agricultural injury cases in the Center's seven-state region. Individual case information from the media can be helpful in understanding the circumstances resulting in injuries. Together these data sources provide valuable information for prevention of injuries in the region.

Outreach Program

The Outreach program focuses on taking observations made by the Center as well as utilizing information from other centers and organizations, and communicating this knowledge to farmers and ranchers in our region and those who work with them to enhance agriculture safety and health practices. We have created an expansive regional Community Contact Network (CCN) email database that includes 27,000 farmers, health care providers, public health officials, Future Farmers of America (FFA) advisors, safety and health professionals and media contacts that are reached electronically with educational materials and reminders. We have continued to create videos to help communicate key observations from projects performed at CS-CASH. A professionally produced hearing protection video featuring regional farmers was completed this year and is being added to the [USAgCenter YouTube video channel](#) as well as the [CS-CASH website](#). Our respiratory protection videos were featured in a media release for the USAgCenter channel and since posting on our website and YouTube in 2013, these videos have been viewed over 1800 times.

CS-CASH has continued to engage youth in helping the Center promote agriculture safety in the region with our second annual FFA short video contest. FFA chapters created 60-second videos on the importance of safety in a variety of agricultural settings that were placed on YouTube and our website; the video with the most hits won the contest. In 2014 the seven videos submitted on the topic of preventing injuries on the farm had over 2,100 views in the three months of the contest. These videos now serve as enduring educational materials on YouTube and the [CS-CASH Website](#). We also recognize the importance of print media, especially for older farmers, and have contributed to a variety of safety and health articles published in ag-related publications including Modern Farmer, Successful Farming, Nebraska Farmer and CropWatch. CS-CASH content experts have appeared on regional radio programs discussing respiratory protection, roadway safety and general farm safety.

Center staff participated in a multitude of face-to-face interactions with farmers and ranchers through large farms shows including Farm Progress and Husker Harvest Days, as well as numerous smaller events. Notably, CS-CASH hosted the annual International Society for Agriculture Safety and Health (ISASH) meeting in June 2014. A record number of ag safety and health professionals, industry professionals and educators from around the world convened in Omaha for the five day long conference.



Livestock and machinery remain leading causes of farm injuries identified in the CS-CASH surveillance survey. More than half of the injuries reported required professional medical care.



Training the Trainer: CS-CASH members train senior FFA members to teach other FFA students and the community about the importance of wearing hearing and respiratory protection in agricultural environments.



FFA students from around the CS-CASH region produced videos on farm safety for the 2nd Annual FFA short video contest. All participating students received a respiratory protection storage bag filled with PPE.



Approximately 46% of intervention participants were found to have moderate or profound hearing loss.



Some older participants said that they were participating in the study to bring awareness to the issue among younger farmers.

An average of 17,040 visitors access the NASD Ag Safety Database each month.



Among the top ten most accessed documents in the NASD database is the Spanish version of a guide to the safe operation of skid steer loaders.

Preventing Hearing Loss Among Farmers by Point-Source Hearing Protection Strategy **Chandran Achutan PI**

The overall objective of this study is to develop, implement and evaluate a novel point-source hearing protection strategy to increase the use of hearing protection devices (HPDs). This randomized controlled trial will test the effectiveness of this highly participatory intervention. To date, 43 farms are participating in this study. Participants in both the control and intervention group completed two questionnaires: the first questionnaire addressed participants' noise exposures and medical history related to hearing; the second questionnaire addressed participant beliefs and attitudes towards HPDs. We then assessed participants' hearing levels by administering hearing tests at their home or place of work.

All major sources of noise on the farm were assessed through interviews, visual observation, and spot noise measurements using a sound level meter. We collected personal full-shift noise dosimetry. We developed a point-source intervention strategy consisting of earmuffs and earplugs placed in a weather-proof box and installed strategically in noisy areas of the farms.

Fifteen participants reported medical related hearing conditions including Meniere's disease, measles and/or mumps, tinnitus and hearing loss. Non-occupational noise exposures included music concerts, fire arms, car racing and industrial jobs. Approximately 60% of respondents reported not intending to wear HPDs. Interestingly, almost all participants agreed that wearing hearing protection can protect their hearing and that losing their hearing would impact their ability to communicate. Approximately 46% of intervention participants and 44% of control participants had moderate or profound hearing loss in at least one ear at the onset of the study.

Fifty percent of the personal dosimetry measures exceed the NIOSH recommended exposure limit. The noise levels ranged from 70.6 to 90.1 decibels. There were more than 100 tractors and 21 combines in the farms that we visited. We installed 41 point-source intervention boxes in the intervention farms, and nearly 90% of these boxes have been used at least once.

Our preliminary findings show that there is a need to educate farmers on the proper use and disposal of HPDs, hazards associated with noise, importance of noise control and use of HPDs. Interviews with farmers reveal a strong interest in protecting their hearing. Younger participants observed the hearing difficulties of their fathers and grandfathers and appeared motivated to use hearing protection. Participants acknowledged that having hearing protectors close to loud noise sources would give them the access to these protective devices when they are most needed.

National Ag Safety Database **Aaron Yoder PI**

The National Ag Safety Database (NASD) is the most widely recognized and used Internet based assemblage of educational resources related to human health and safety in production agriculture. The goal of this project is to make audience targeted educational resources from NIOSH centers, researchers, educators, and standards accessible to end users in the agriculture, forestry, fishing, and hunting industry. To accomplish our goal, researchers identify, solicit and add new safety and health print materials; review materials on an ongoing basis for accuracy and usefulness; identify, solicit and add more on-line safety and health non-print materials; develop new original on-line training units for the NASD website; solicit and develop more multilingual resources and promote NASD and NIOSH safety and health efforts. Work on these goals will continue in years four and five.

Conceptual Arts, Inc. has recorded the site analytics for the NASD from September 2013 through August 2014. An average of 17,040 site visits per month with an average of 26,380 page views per month were recorded. Three quarters of the visits come from the United States, and the majority of the visits come from English speaking countries. Over 80% of the visits were from desktop/laptop computers leaving less than 20% of the visits from mobile devices/tablets. The most accessed document was related to preventing stress, and one of the top 10 most accessed documents was written in Spanish. Twenty new documents were added to the site in this time period. A major effort was conducted to update broken links and optimize the site.

Two teleconferences were held with representatives from other NIOSH funded Agricultural Safety and Health Centers to present updates of the NASD and to encourage other centers to contribute materials to the NASD.

There are several opportunities provided on the NASD Web site for users to ask questions, report problems, or recommend materials. Most of these messages are questions about safety or health issues, and they all receive a response in a timely manner.

Education/Translation Core

Aaron Yoder Director

Over 70 participants from across the US have taken the week-long Agricultural Medicine course offered by CS-CASH since the first course was offered at the UNMC College of Public Health in 2011. The core course provides an overview of key health and safety issues specific to rural and agricultural workers.

The course is designed for professionals who work with or have an interest in agricultural health and safety including: physicians, physician assistants, nurses, advanced practice nurses, veterinarians, health educators, migrant health clinicians, physical therapists, Ag extension, insurance specialists, and NIOSH Ag Center personnel. Participants spend 32 hours in class and 4 hours of training at the University of Nebraska research farm in Mead Nebraska. Yearly course evaluations have been excellent.



Evaluation Program

Mary Cramer PI

The CS-CASH evaluation team administered the annual [\(ICE©\) survey](#) to track the Center's governance effectiveness. The Center continues to have positive levels of effectiveness in each of the conceptual constructs of successful coalitions based on response from our Center Leaders and Members. There is a strong sense of shared *Social Vision* and we continue to exhibit collaborative *Relations* that foster a learning environment to enhance best practices and knowledge in agricultural safety and health. We conducted follow-up field visits with our pilot project investigators and found that most have submitted new grants (13 submissions from 6 investigators) and all have plans for moving beyond pilot funding. Findings from our field visits show that investigators reported high level of satisfaction with the Center's support and resources for their research. All have requested on-going affiliation through list serves and newsletters.

We continue to meet regularly with the Center Leadership to refine our [Logic Model](#) (LM) measures and indicators based on annual evaluation data. In year four, we will be implementing a new social network analysis to measure the impact of our LM Activities with Stakeholders and End Users. We will also begin measuring changed Knowledge, Attitudes and Practices of our LM End Users by incorporating an Evaluation Survey that is administered across the Center by the various projects. Finally, we have placed a greater emphasis on measuring the economic impact of the Center. Dr. Fernando Wilson, a health economist, joined our evaluation team to analyze the Center's cost benefits relative to our goals to reduce hearing loss, improve respiratory health, and prevent injuries.

We continue to monitor LM Activities, Outputs, and Intermediate Outcomes through our Access Database, ADIS, and personal interviews. Findings document that the Center "outreach" has significantly expanded over the last three years. Total Center activities/products increased more than 160% (112 to 299 entries) from year one to year three. Peer reviewed publications increased 130% (9 to 21) and peer reviewed presentations increased 95% (46 to 90).

We mailed our annual *Midwestern Farm Operators Respiratory and Hearing Health Survey* this year to a random sample of Ag operators in our seven-state region (21% response rate). Results were disseminated through: a) *Successful Farming Magazine* (two articles in February 2014), reaching 420,000 farm families; and b) rural radio affiliates in March 2014, reaching 300,000 listeners.

Findings (2012 – 2013) showed a 14% increase in respondents' attitudes about the importance of wearing a mask in dusty conditions, but there was a decrease in the reported use of hearing and respiratory protection. Respondents over the age of 55 years believe continued education is important for farm youth to increase knowledge, change attitudes, and improve health practices for use of protective equipment. A manuscript is under development and findings will be presented at the American Public Health Association (APHA) Conference in November. An example of the a response to an open ended question regarding respirator use:

"I've used the simple face mask respirators before due to issues with dust. I know that I've got some lung damage because of working in grain, hay, and straw dust many, many years ago. I learned from your videos: the proper fit and care of each type of respirator; which I had never seen or read before seeing these videos. Thanks again for helping keep farmers safe and healthy. We sure do appreciate your help."

We participate in the Ag Centers Evaluator and Outreach (ECO) monthly phone conferences and in selected task forces that advance evaluation.

The Center tracks morbidity and cost utilization data (i.e., reported hearing loss, respiratory disease, injury, health care costs) through random sample surveys measuring our long-term impacts in the region. Our most recent findings are that 2.05% of respondents report having COPD and asthma, which results in loss of 7.7 and 3.0 Quality Adjusted Life Year (QALY's) per case, respectively. Dr. Wilson has calculated that the total healthcare expenditures for this respondent group was \$5.8 million last year. There were 6.1% of respondents reporting at least one injury per year, which resulted in 8,565 lost farm workdays and \$15.8 million in economic losses from injury among all ag operators in the CS-CASH region.



CS-CASH Pilot grant recipient
Kathy Morris is the project director for a three-year \$769,000 grant that will launch a program offering advanced education and training for family nurse practitioners who work in rural and underserved areas.



Pilot study results indicate a strong relationship between the number of hours that a farmer sleeps and how well he or she can maintain their balance.



The summer 2014 issue of Modern Farmer contained data generated from the CS-CASH press clipping database. News organizations and researchers are able to request specific information on fatality and injury rates in the CS-CASH region.

Pilot and Emerging Issues Projects Eleanor Rogan Program Director

An essential program within CS-CASH is the Pilot/Feasibility Projects and Emerging Issues Program, which supports pilot and feasibility projects with the goal of enabling investigators to collect preliminary data to support submission of grant applications for independent, longer-term, larger projects related to agricultural safety and health. The central hypothesis of this program is that pilot and/or feasibility projects funded from this Center will result in subsequent grant submissions to NIOSH or other funding agencies to advance agricultural health and safety research. The projects selected for support by this program must address a critical issue in agricultural safety and health and clearly lead to future, more extensive study of the selected critical issue. In the first three years of funding, 16 pilot projects have been funded by CS-CASH.

- Year 1 - 5 Pilot Projects funded with \$60,000 contributed by the UNMC Vice Chancellor of Research. Year 2 - 7 Pilot Projects funded with \$40,000 contributed by the UNMC Vice Chancellor of Research. Year 3 - 4 Pilot Projects funded.

Pilot Project data used to generate larger awards include: AgHealth Nebraska (\$100,000 Nebraska Research Initiative Grant) and Prevention and Treatment of Agricultural Respiratory Disorders: A Pilot Educational Program of Rural Health Care NPs and PAs (\$769,000 HRSA Grant).

Announcements of the availability of funding for the fourth year of pilot/feasibility projects were distributed in May 2014. Seventeen proposals were submitted and are currently under review.

Effects of Sleep Deprivation on Balance, Stress and Recovery among Farmers Ka-Chun (Joseph) Siu PI

Working hours in agriculture are highly seasonal and fluctuate with the weather. Spring planting and fall harvest involve extremely long workdays and farmers often have less sleep during those busy times. Sleep deprivation might cause balance instability contributing to slip, trip, loss of balance and fall injuries, which are common and serious among aging farmers. This project studied the performance among farmers longitudinally in repeated one-week observation periods before, during and after the busy spring planting and fall harvest seasons. Our pilot work has clearly indicated a strong relationship between sleep hours and instability in crop farmers. Increasing sleep loss can cause balance instability. We also found that our sample of six farmers were about seven times more likely to be unstable when they slept less than their average hours the night before the testing. These important data allow us to develop a larger scale of research and ultimately provide more scientific basis to form better recommendations for farmers to self-regulate their sleep and working hours in prevention of agricultural injuries.

Emergent, Re-emergent, and Persistent Issues in Agricultural Safety and Health in the CS-CASH Region Murray Madsen PI

Quarterly summaries of current press clips related to agricultural injuries and fatalities are analyzed, coded, and entered into an accessible dataset. These help track the evolving, persistent experience of producers and highlight targets for continuing prevention-intervention work. In CY2013, press clips captured 86 fatal (versus 92 in 2012) and 92 non-fatal events (versus 102 in 2012); 73% of fatal and 68% of nonfatal events involved mobile machinery. Overturns and run-overs were almost half of the mobile machinery deaths; collisions between farm equipment and motor vehicles top the non-fatal injuries at 30% of the nonfatal injury events involved in the "Tractors and Mobile Machinery" category. These data were used to create media messages that were disseminated to newspapers and used in email blasts to 27,000 farmers and ranchers in the CS-CASH seven-states region. Work is underway analyzing relationships between nonfatal injury events in press clippings and injuries reported in survey work by CS-CASH with USDA NASS. These data were shared throughout the year with researchers, agricultural reporters and others who required statistics on injury and fatality rates.

AgHealth Nebraska: a novel preventive health services model for Nebraska Farm Families

Matthew Beacom PI

The AgHealth Nebraska model addresses the medical and farm safety education needs of farm families. The AgriSafe Network, Certified Safe Farm, and wellness concepts have been incorporated into modern rural clinical practice. It is the aim of the AgHealth model to detect serious health conditions at an early stage, identify and remove injury and illness hazards, set personal wellness goals, and provide incentives for farmers to manage their health and wellness. AgHealth is designed to be sustainable with client fees, insurance reimbursements and agribusiness support. It is anticipated that participants will improve their health behaviors and reduce health and safety hazards. In the long term, this model will reduce injuries, illnesses and related costs.

Ten farms in Nebraska participated in this study. An occupational nurse with a farming background has been trained to perform the farm visits. The nurse performs both the health and farm safety assessments. Using a customizable iPad application (BioCheck™) the health screening data are safely stored and can be readily accessed by the clinic physician. Working in collaboration with a business consultant and the AgriSafe Network, a business model is being developed that will guide future studies and assure long term sustainability. This model will provide a financial platform to identify insurance and industry business partners.

The 10 farms participating in the study have all completed the farm and wellness audit. Excellent feedback has been received on the safety inspection as well as the health screening. Neighboring farmers are inquiring about being a part of the study group. Study investigators are looking at the feasibility of continuing this work as another study or working with other agencies to ensure that this project can continue. It is clear to that the work is necessary and with time could become self-sustainable. In Fall 2014 investigators will follow up with the initial pilot group and determine what modifications they have made to become safer and healthier.

Grain Dust Exposure in the Allergic Lung

Jane Schuh PI

Agricultural workers and farming communities are repeatedly exposed to grain dust during harvest, transport, and storage. The recognition that this complex mixture of particulates can trigger acute respiratory distress is not new, but the ways in which it may exacerbate both immediate and long-term outcomes of allergic asthma remain unclear. The objectives of this study are to investigate the impact of repeated grain dust inhalation on normal lungs and to compare/contrast that with the effect on allergic lungs. Our intent is to characterize the occupational risk of dust inhalation to an individual who is sensitized to fungus in order that evidence-based decisions on personal protection can be implemented. Dust samples were collected from the rafters of commercial grain elevators dealing in each commodity. We reported earlier that there were few bacterial organisms that could be cultured from either dust sample, and all of these were Gram-positive, spore-forming rods. Three fungal species were identified in the corn dust sample—*Acremonium*, *Aspergillus*, and *Penicillium*. While only 2 fungal species were identified in the soy bean dust sample—*Aspergillus* and *Penicillium*—there were nearly 3.5 times as many colony-forming units per gram of dust in the soybean sample as compared to the corn sample.

Using an inhalation model of fungus-induced asthma that was developed in our laboratory, we used mice that had been sensitized to and challenged with *Aspergillus fumigatus* fungus to examine the effect of repeated exposure to corn or soybean dust (3, 20-min exposures). We hypothesized that bacterial load would have little effect, as the bacterial load in the dry samples were assumed to be bacterial spores that would be cleared quickly by a neutrophilic response. This was supported by studies in naïve mouse lung which showed a robust, short-lived neutrophilia within hours of dust inhalation. We further hypothesized that fungal allergens would react and/or cross react to exacerbate the effects of the anti-fungal allergic response.

Removal of viable bacterial organisms by irradiation of the dust did not alter airway hyperresponsiveness, airway inflammation, or airway wall remodeling when compared to non-sterile dust exposure. Further, the additional fungi in the dust samples did not appreciably impact these parameters, as compared to animals that did not receive a dust treatment. Interestingly, when compared to allergic animals that did not receive dust exposure, both IgA and IgE were significantly decreased in the blood of allergic animals after exposure to sterilized soybean dust. We do not have a mechanism of action for this result, but speculate that it may be due to anti-inflammatory properties of the soybean itself.

Although caution should be taken in extrapolating these data to a broader context, our work shows no deleterious link between fungal allergic asthma and increased morbidity after inhalation of grain dust from corn or soybean.





The research team held community meetings across Nebraska to discuss the importance of the project.



Stress and depression were found to be common among Latino migrant farmworkers with almost 46% of workers reporting symptoms of depression.

The Migrant Health Task Force has proven to be a valuable asset for sharing information and developing potential solutions to stress, depression and substance abuse concerns.



Understanding the cause of COPD inflammation, the COPD microbiome and its alteration of lung defense, is critical for implementation of antimicrobial interventions.

Stress and Mental Health Among Latino Farmworkers **Athena Ramos PI**

The Migrant Farmworker Health Study was developed to gather baseline data on the health of Latino migrant farmworkers in Nebraska, to better understand the migratory pattern of these workers, and to develop recommendations to improve working and living conditions for migrant farmworkers. As part of the project, a Migrant Health Task Force was created and facilitated to engage a diverse group of community partners in the initiative. Members of the Migrant Health Task Force include: University of Nebraska Medical Center, Center for Reducing Health Disparities; Creighton University, Office of Multicultural Affairs; Nebraska Migrant Education Program; Justice for Our Neighbors-Nebraska; and El Centro de Las Americas. The Task Force developed a survey that consisted of 103 questions about demographics, current health status, stress, depression, and substance use.

The research team held community meetings in towns where farmworkers lived to discuss the importance of the project and obtain their participation in the study. The team visited eight communities in five central Nebraska counties and had 200 people participate in the study. Participants were given a resource booklet on mental health, managing stress, substance use, and a listing of community health centers/migrant health centers in the state.

From the data collected, the team found that there were high levels of stress and depression among Latino migrant farmworkers, with almost 46% of workers reporting symptoms of depression. There is a relationship between stress and depression; among those who were stressed, over 70% were also depressed. The team developed categories of stress and a system to understand which stressors affect the feelings of depression. Almost 50% of stress was related to economics, living conditions, acculturation, and being socially isolated. Additionally, among those who were depressed, 24.5% reported that they had been injured on the job as compared to 12% among those who were not depressed. These results highlight the need for a comprehensive strategy to provide culturally, linguistically, and contextually relevant health education and interventions to improve mental and emotional health, occupational safety training, and access to appropriate social support services.

The team has put together a series of recommendations based on the data to improve living and working conditions for migrant farmworkers in the Midwest. Currently, the team is in the process of sharing these findings and recommendations with community stakeholders and researchers.

This project has had an impact by starting a discussion on migrant farmworker health in Nebraska. A relationship with the Consulate of Mexico in Omaha, Department of Labor, and Legal Aid of Nebraska has been established. There are a number of organizations across the state including the Center for Rural Affairs, Heartland Worker Center, and Justice for Our Neighbors-Nebraska among others that are now working to organize and educate Latino immigrants in rural areas, which may have implications for improving conditions for migrant farmworkers too.

Chronic Bacterial Colonization, Agricultural Exposure and COPD **Tricia LeVan PI**

Chronic obstructive pulmonary disease (COPD) is the third leading cause of death and a major cause of morbidity among persons greater than 45 years of age. Farming has been associated with COPD. Among farmers, it has recently been estimated that the prevalence of COPD is 30% in smokers and as much as 17% in never smokers. This study provides an opportunity to examine the airway microbial structure and function. The central hypothesis is that the indigenous airway microbiome changes with airway obstruction and agricultural exposure. The cohort consists of 20 COPD patients with or without agricultural dust exposure. Induced sputum samples have been collected. These samples were analyzed by 454 pyrosequencing, the data have been downloaded and the initial analysis phase of the mega-dataset has begun. To facilitate successful collection of induced sputum a high-pressure nebulizer is being purchased. A VA Merit application has been submitted using preliminary data generated from the CS-CASH program. A grant Application to NIH will be submitted in November 2014.

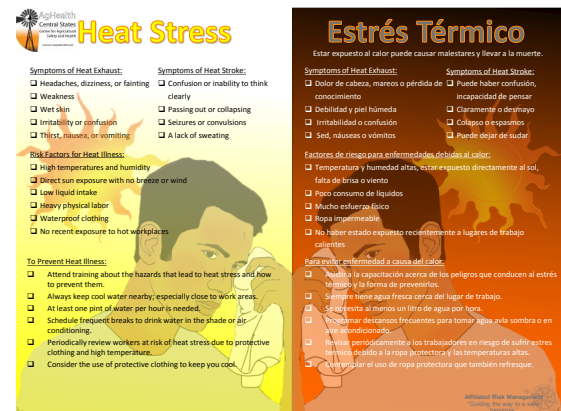
Breakthroughs in understanding the types of bacteria that infect the lungs of farmers and ranchers after exposure to agricultural dust will lead to better treatments and outcomes.

Imminent Hazards in English and Spanish

Jason Stratman PI

A survey of 20 hazards common to agricultural sites was developed and distributed to agricultural workers in the central and western Nebraska regions. Over a 1-year period, surveys were distributed during agricultural training sessions and at regional farm and ranch shows. There were a total of 169 respondents, of which 69% were from feedlot operation and 31% were from harvest operations.

After the surveys were collected and the results summarized, an advisory committee was assembled to review the survey data and determine the final hazards to be depicted on pictograms. Members of the advisory group included two safety consultants with agricultural clientele, a feedlot operation manager, and a professional appraiser whose main focus is agricultural operations. After reviewing the results, the group consensus was to incorporate the top 15 hazards into 10 pictograms as well as to include information on the dangers of talking and texting while driving. The justification was that more information is better and that people could remove content as they saw fit because the pictograms would be available in a modifiable version.



Example of one of ten bilingual pictograms that can be modified by agricultural employers.

A local vendor was selected to develop the pictograms, one of their staff members was fluent in English and Spanish. Once the advisory committee decided on the content, the information was given to the vendor for development. The pictograms were developed in Microsoft PowerPoint. This is popular software and allows for easy modification. The pictograms were completed in April 2014. The intent of the pictograms is to bridge the growing English-Spanish communication gap; particularly for hazards that are imminent. Now that they are developed, employers and employees can have free access to the materials for distribution. It is anticipated that they will be used in a preventative way as part of short training sessions and reference material. The pictograms have been added to the [National Agricultural Safety Database](#) (NASD) and are available on the [CS-CASH website](#).

Collaborators on this project included: Bartlett Appraisal – Scottsbluff, NE; Common Sense Safety – Cozad, NE; Affiliated Risk Management – Gering, NE; Dinklage Feedyards – Sidney, NE; Winner Circle Feedyard – Minatare, NE; Panhandle Coop – Scottsbluff, NE; and Western Nebraska Community College – Scottsbluff, NE.

Pre-Professional Perceptions of Safety and Quality Concerns in Agricultural Work Environments

Gretchen Mosher PI

A strong positive correlation between agricultural quality problems and increased occupational safety risk has been documented, yet no empirical evidence demonstrated that pre-professional college students in the field of agriculture were aware of the association between the two concepts. The objectives of this study were to determine if agricultural pre-professionals perceived a positive correlation between occupational safety and quality management in agricultural work environments. The secondary objective was to determine if their perceptions differed by gender, their academic discipline, their academic classification, their agricultural work experience, or their childhood environment (i.e. raised on a farm or raised in non-farm environment).

An existing safety instrument was modified to include quality management components. The instrument was piloted with approximately 60 senior level students and then administered to approximately 4,000 undergraduate students in Iowa State University's College of Agriculture and Life Sciences in the fall of 2013. Valid responses were received from 933 students, for a response rate of 24%.

Students perceived a high importance of both safety and quality, but a lower level of awareness and experience with the two concepts in agriculture. Furthermore, students also perceived a high impact of quality management systems on reducing agricultural safety hazards, but they did not feel that the mitigation of quality issues would actually lower the number of incidents.

Perceptions of students did not differ significantly by their discipline of study, their childhood environment, or their work experience in agriculture. Females perceived quality management systems to have a stronger mitigating influence on safety incidents and hazards than did male students. Quality management education represents an alternate method of reaching agricultural students regarding work-place safety issues before they enter the field of agriculture. For this reason, solidifying the perception of students on the interconnectedness of managing quality and safety in agriculture is critical. Results of this study have been published and will be used for direction in curriculum development.



After participating in on-farm health screenings and safety assessments nursing students have a better understanding of rural health care.



Communicating risk in terms of cost of injury/benefit of safety measures may make farmers more likely to attend to preventive measures in order to avoid the injury.



Study participants at a farm in Pender NE demonstrate how easily a safety guard can be removed from an auger.

Certified Safe Farm Pilot Program Dennis Holtz PI

The Nebraska Safety Center in Kearney, Nebraska, partnered on an AgHealth Nebraska farm safety assessment project with CS-CASH and Kearney's UNMC College of Nursing. The assessments and health screenings took place in the Kearney-area on farms that were randomly selected. The health screenings are conducted by first-year nurses in training from the UNMC College of Nursing program in Kearney using a mobile lab brought to the farm sites. Farmers, their families, and employees are screened on site for blood pressure, glucose, hearing loss, skin cancer and other health issues. This screening allows study participants to identify potential health issues, set personal wellness goals, and provides help in managing their healthcare. In addition to health screenings, Nebraska Safety Center personnel conduct safety assessments that include identifying, removing, or fixing injury hazards on farm properties. The health screenings and safety assessments were covered widely in the local news, increasing interest in this project.

In addition to training healthcare professionals and improving health outcomes this project aims to implement the Certified Safe Farm program and partner with insurance companies and other organizations so that agricultural workers are acknowledged for having effective farm safety awareness programs in place. It is anticipated that compliance leads to a better safety record and can give farmers a break in insurance costs.

Antelope Memorial Hospital Ag Safety Program PI Carol Anderson

Antelope Memorial Hospital (AMH) is a not-for-profit corporation located in Northeast Nebraska serving approximately 7,500 rural residents in 15 communities. Medical clinics are located in five communities in its service area of seven counties. Antelope Memorial Hospital and its providers address the overall health care and wellness of area farm families. However, there is not a specialized program currently available for educating farmers and ranchers of the occupational hazards of production agriculture. This project is designed to integrate a pilot evidence based primary prevention program geared toward the occupational health and safety of farm and ranch families. Wellness, Farm Safety Events, personal protective equipment (PPE) demonstration and health screenings are being designed as part of the hospital program to promote safety on the farm and ranch.

Community Driven Solutions to Address Farm Injuries Lea Pounds PI

The overall objective of this pilot project is to test an innovative participatory decision-making approach by engaging members of the farming community in co-creating an intervention to prevent farm injuries.

The first activity involved convening a small group of farm women as co-creators for the project. The women attended a day-long meeting in Omaha, Nebraska, to look at data on farm injuries. After discussing data, the women developed a matrix of the frequency and impact of types of injuries based on real world experiences. Study participants identified two areas of concern: 1) existing data does not consider the psychosocial impacts of farm injuries; and 2) the monetary costs of injuries in the available data are not delineated by type of injury event making it impossible to assess which types of injuries result in the greatest costs. Another meeting in Pender, Nebraska, focused on safety features on farm equipment as well as talking with local farmers about barriers and motivators related to engaging in safer practices. The group identified using prompts or reminders as a good way to increase safety considerations when working with equipment. They decided that standard safety precaution signage on equipment is too easy to overlook and identified more graphic signage that could be used in addition to standard warning labels. They also decided that having a simple reminder checklist that could be adhered to equipment control panels would increase adherence with safety practices. Currently ways to pre-test the group's ideas are being explored.

Development of a Multi-State Capacity to Disseminate and Evaluate the Efficacy of a Web-Based Stress management Program for Agricultural Producers

Katherine Slama and Patrick Hart PIs

In an effort to address the unmet needs for prevention of behavioral health problems, a symposium was assembled to provide input on online Dealing With Stress (DWS) workshops and forming a consortium to disseminate and evaluate them. The symposium successfully engaged a variety of stakeholders from four states. Their input was most useful in setting out guidelines for further grant proposals.

Identification of critical stakeholders is an important outcome. These participants and their organizations are likely to form the core of the advisory boards involved in carrying out future grants. These participants and their organizations will be invaluable in the effort to obtain further grants, where the greater leveraged impact will occur. The qualitative output consists of the detailed comments and suggestions that symposium participants provided. Their sharing of information about rural behavioral health needs of the population in their respective states is a valuable outcome.

The first grant proposal based on this project will be for HRSA's Rural Health Care Services Outreach Grant (RHCSOG) Program. Its purpose is to seek "...projects that demonstrate creative or effective models of outreach and service delivery in rural communities". Both Principal Investigators have prior experience serving as RHCSOG Program grant reviewers. However, if funding from that source is not obtained, the groundwork will have been laid to pursue both service-oriented foundation funding and more research-oriented funding.

Beyond the dissemination and evaluation grant, there are any number of opportunities for additional research involving the DWS Workshops across geographic and ethnic populations and agricultural sectors. Research may also identify the parts of the workshops that best serve particular agricultural and rural people and whether the workshops can serve a purpose in clinical practice.

Feedlot New Hire Safety Orientation

PI Gordon Moore

In January of 2014 this pilot project was initiated by filming three feedlot employees and/or managers reading a safety orientation script written by Gordon Moore of Moore Ag Safety. The scripts were customized to each feedlot. The videography was done in much the same manner as a *YouTube How To* video. This was done in order to help with employee "buy in" for the project and to aid with the initial cost. Each yard was chosen for its number of employees, accessibility and proactive mindset towards safety. Each feedlot took a different approach to producing their video. One feedlot used all supervisors, another used only management level employees while, yet another used a majority of entry level employees. The script was provided in English and Spanish in order to accommodate Spanish speaking workers, however, for the most part the videos were created in English. The intent was to limit the length of the video, but it was found in order to cover all the information pertinent to orientation the length needed to be extended. After the videos were completed, each feedlot was given a copy to use as an orientation for new employees and/or continued training for existing employees.



During the production of these videos, a Safety Management System was introduced within the industry. One of the Pilot Project orientation videos was added to this computer based training system. Although the use of this type of training is relatively new to the feedlot industry, this computer based training has been well received. The other two feedlots are using their videos for orientation without the computer based system. All feedlots were pleased with the finished product.

Videos were distributed to each facility in June of 2014. Each feedlot will use the videos as they hire new employees. A survey will be taken at each feedlot in December of 2014 in order to gather information about the number of employees using the videos, how the process was received and whether the use of a customizable video is viable in the feedlot industry. This information will be provided to CS-CASH after being evaluated by Moore Ag Safety.

Nebraska Pesticide Poisoning Surveillance Review and Outreach PI John Lowe



Agricultural workers and pesticide applicators have the greatest risk of experiencing severe pesticide poisonings.

Nebraska Pesticide Poisoning Surveillance Review and Outreach Pilot project is a collaborative effort by the Nebraska Department of Health and Human Services, Nebraska Regional Poison Center and investigators at UNMC/CS-CASH. The primary focus of this pilot research is to analyze pesticide poisoning case data to improve the Nebraska pesticide surveillance program launched August of 2013. In addition to data analysis the pilot project is also initiating various outreach efforts aimed at improving awareness and engagement in order to ultimately increase reporting of pesticide poisonings. The pilot project collaborators developed a coordinated messaging campaign that launched in May 2014, delivering pesticide poisoning information, pesticide poisoning data, and reporting requirements to health care providers and public health departments throughout Nebraska. Additionally, project investigators have contracted with the Pesticide Safety Education Program at the University of Nebraska-Lincoln using pilot project funds and in-kind matching funds obtained by the Nebraska Department of Health and Human Services collaborator to develop public service announcements that will air on rural radio stations. Creation and delivery of Spanish language public service announcement through Spanish radio stations is also being explored through a potential collaboration with the CS-CASH Stress and Mental Health Among Latino Farmworkers pilot project.

Prevention and Treatment of Agricultural Respiratory Disorders: A Pilot Educational Program of Rural Health Care NPs and PAs Kathy Morris PI



Agricultural workers are exposed to an ever expanding number of potentially harmful agents that can affect the respiratory system. The prevention and treatment of acute and chronic illness related to agricultural respiratory disorders, is a necessary component in caring for the rural agricultural worker. In Nebraska, Nurse Practitioners (NPs) and Physician Assistants (PAs) provide care in rural areas of the state, however many have not had any formal education regarding agricultural-related respiratory diseases. This study evaluates the knowledge level of NPs and PAs regarding evaluation, diagnosis and treatment of agricultural respiratory diseases and pilots an innovative, evidence-based, continuing education program utilizing problem-based learning strategies.

Results from a survey sent to 631 NPs and PAs in Nebraska indicated that 71% were uncomfortable or somewhat uncomfortable recognizing and treating agricultural related illnesses; however, 75% of the participants indicated that they would be interested in continuing education on respiratory-related disorders in agricultural workers. The knowledge portion of the survey indicated a need for education in a number of respiratory health topics. Educational programs and seminars for NPs and PAs are currently underway. The objectives for each session are for participants to be able to describe five common agricultural respiratory hazards, identify four respiratory conditions associated with agricultural dust and gas exposure and to determine when personal respirators are appropriate for use in the prevention of acute and chronic agricultural respiratory disease.

Data from this study were used in a grant application resulting in funding of a three year \$769,000 HRSA grant that will be used to launch a program that offers advanced education and training for family nurse practitioners who work in rural and underserved areas.



CS-CASH Core and Program Activities FY03

No. of Activities

September 01, 2013– August 31, 2014

Course/Curriculum (short course or training)	12
Material Distribution	29
Meeting/Conference	26
Training/Demonstration	15
Workshop	1
Total	83
Article (peer reviewed)	20
Peer Review (grant/paper)	3
Presentation (oral)	74
Presentation (poster)	16
Abstract	3
Annual Report	2
Article/Report (non-peer reviewed)	18
Booklet/Brochure/Factsheet	2
Interview (media/other)	11
Newsletter	13
Video/Multimedia Material	5
Email Blast to Regional Farmers (14,200 to 27,000)	6
Email Blast to Regional Rural Health Care Providers and PH Officials	7
Email Blast to Regional FFA Groups	5
Website	1
Total	186
Evaluation Instrument/Tool	2
Focus Group	1
Questionnaire/Survey/Checklist	8
Site Visit	2
Farm Safety Audit	17
Total	30

Total CS-CASH Member Activities	299
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CS-CASH Peer-Reviewed Publications FY03 (9/1/13 — 8/31/14)

1. Cramer, M.E., Wendl, M.J.. Childhood Agricultural Safety and Health: Evaluating Network Outcomes and Impacts. *Journal of Agromedicine* In Review August 2014.
2. Davidson CS, Green CF, Gibbs SG, et al. Performance evaluation of selected N95 respirators and surgical masks when challenged with aerosolized endospores and inert particles. *J Occup Environ Hyg*. 2013;10(9):461-467.
3. Gibbs SG, Sayles H, Colbert EM, Hewlett A, Chaika O, Smith PW. Evaluation of the relationship between the adenosine triphosphate (ATP) bioluminescence assay and the presence of bacillus anthracis spores and vegetative cells. *Int J Environ Res Public Health*. 2014;11(6):5708-5719.
4. Goldner WS, Sandler DP, Yu F, et al. Hypothyroidism and pesticide use among male private pesticide applicators in the agricultural health study. *J Occup Environ Med*. 2013;55(10):1171-1178.
5. Ramaswamy, S.K. and G.A. Mosher. Perceptions of agricultural college students on the relationship between quality and safety in agricultural work environments. Under review by *Journal of Agricultural Safety and Health*.
6. Ramaswamy, S.K. and G.A. Mosher. 2014. Pre-professional perceptions of safety and quality concerns in agricultural work environments. ISASH Paper #14-03. Omaha, NB: ISASH.
7. Lea Pounds, Ellen Duysen, Debra Romberger, Mary E. Cramer, Mary Wendl, Risto Rautiainen Social Marketing Campaign Promoting the Use of Respiratory Protection Devices Among Farmers.; *Journal of Agromedicine* ;Vol. 19, Iss. 3, 2014
8. Karttunen JP, Rautiainen RH. Characteristics of and risk factors for compensated occupational injury and disease claims in dairy farmers: A case-control study. *J Agric Saf Health*. 2013;19(3):191-206.
9. Berg I, Hanson C, Sayles H, et al. Vitamin D, vitamin D binding protein, lung function and structure in COPD. *Respir Med*. 2013;107(10):1578-1588.
10. Boissy RJ, Romberger DJ, Roughead WA, Weissenburger-Moser L, Poole JA, LeVan TD. Shotgun pyrosequencing metagenomic analyses of dusts from swine confinement and grain facilities. *PLoS ONE*. 2014;9(4).
11. Dusad A, Thiele GM, Klassen LW, et al. Organic dust, lipopolysaccharide, and peptidoglycan inhalant exposures result in bone loss/disease. *Am J Resp Cell Mol Biol*. 2013;49(5):829-836.
12. Malireddy S, Lawson C, Steinhour E, et al. Airborne agricultural particulate matter induces inflammatory cytokine secretion by respiratory epithelial cells: Mechanisms of regulation by eicosanoid lipid signal mediators. *Indian J Biochem Biophys*. 2013;50(5):387-401.
13. Ka-Chun Siu, Theresa Tonozi, Christopher Wickwire, Matthew Beacom, Sabin Bista, Risto Rautiainen Quantifying the Association of Sleeping Hours and Balance Biomarkers in Farmers, *Journal of Agromedicine* Vol. 19, Iss. 2, 2014
14. Wyatt, T. A., S. M. Wells, Z. A. Alsaidi, J. M. DeVasure, E. B. Klein, K. L. Bailey, and J. H. Sisson. Asymmetric dimethylarginine blocks nitric oxide-mediated alcohol-stimulated cilia beating. *Mediators of Inflammation* (In Press), 2013
15. Bailey, K, Wyatt, T, Wells, S, Klein, E, Robinson, J, Romberger, D, Poole, J. Dimethylarginine dimethylaminohydrolase (DDAH) overexpression attenuates agricultural dust extract-induced inflammation. *Journal of Environmental Immunology and Toxicology*
16. Berger JP, Simet SM, DeVasure JM, et al. Malondialdehyde-acetaldehyde (MAA) adducted proteins bind to scavenger receptor A in airway epithelial cells. *Alcohol*. 2014;48(5):493-500.
17. Nordgren TM, Wyatt TA, Sweeter J, et al. Motile cilia harbor serum response factor as a mechanism of environment sensing and injury response in the airway. *Am J Physiol Lung Cell Mol Physiol*. 2014;306(9):L829-L839.
18. Yoder, AM, Schwab, CV, Gunderson, P, Murphy, D. Safety and Health in Biomass Production, Transportation, and Storage: A Commentary Based on the Biomass and Biofuels Session at the 2013 North American Agricultural Safety Summit
19. Lina Lander, Ketki Patel, Dana Loomis, Shinobu Watanabe-Galloway, Gleb Haynatzki, Rosa Gofin, Rohan Jadhav, Risto Rautiainen. 0354 Non-fatal agricultural injuries: Surveillances in the Midwestern United States. *Occup Environ Med*. 2014 Jun;71 Suppl 1:A43.
20. Rohan Jadhav, Lina Lander, Chandran Achutan, Gleb Haynatzki, Shireen Rajaram, Ketki Patel, Risto Rautiainen. A Systematic Review of Male Gender, History of Prior Injury, Full Time Working Status and Farm Owner/Operator Status as Risk Factors for Agricultural Injuries. *Journal of Agromedicine* 01/2014; 19(2):215-216.

Non-peer Reviewed Articles/Manuscripts FY03 (9-1-13 — 8/31/14)

1. Ramos A., Kumru E., Henry S. Migrant Farmworker Health Study. UNMC Today, June 14, 2014
2. Ramos A. Study Helps to Improve Lives of Migrant Workers. UNMC Newsroom, June 5, 2014
3. Ramos A., Kumru E. Migrant Farmworker Study. UNMC Discovery Magazine, June 5, 2014
<http://www.unmc.edu/news.cfm?match=15233>
4. Yoder A. Tractor Safety Course Stresses Safety, Helps Teens with Employment. Nebraska TV, May 23, 2014
<http://www.nebraska.tv/story/25603024/tractor-safety-course-stresses-safety-helps-ag-teens-with-employment>
5. Cramer M, Wendl M, Tevis C. Respiratory and Hearing Protection Articles. Progressive Farmer April 01, 2014
6. Morris K. College of Nursing Grant will Enhance Rural Medicine Care. UNMC Today, February 28, 2014.
7. Wendl M, Duysen E., Tevis C. Say What? Hearing Loss Isn't Something That You Have to Live With. Successful Farmer, February 15, 2014.
8. Wendl M, Duysen E., Tevis C. Save Your Breath– Protecting Lung Function on Farms is a Matter of Life and Breath. Successful Farmer, February 04, 2014.
9. Holtz, D. Farm Safety Clinical Day Offers Important Lessons. UNMC News Website. October 22, 2013
10. Morrow S., Holtz D. Students Participate in Farm Safety Project. Kearney Hub September 18, 2013
11. Holtz D. This Week is National Farm Safety and Health Week. Kearney Hub (Picked up by AP) September 16, 2013
12. Wyatt T. Research into the Effects of Agricultural Dust Exposures on Chronic Inflammatory Lung Disease. UNMC News September 15, 2013 <http://blog.unmc.edu/publichealth/2013/09/15/todd-wyatt-phd-research-into-the-effects-of-agricultural-dust-exposures-on-chronic-inflammatory-lung-disease/>
13. Holtz D. Group Brings Safety Awareness to Farms. Kearney Hub (Picked up by AP) September 10-14, 2014



CS-CASH has produced weatherproof PPE Farm and Ranch Safety Boxes containing safety glasses, ear muffs and plugs, respiratory protection, a guide for selection of respiratory protection, recommendations about where and when to use PPE and information on where to buy quality products. The boxes are distributed to farms that have passed the Certified Safe Farm safety assessments. Magnets on the box make it quick and easy to install on grain bins or metal shops ensuring that PPE is available where and when needed.

The PPE box was modeled after the hearing protection boxes used in Chandran Achutan's project—Preventing Hearing Loss Among Farmers by Point-Source Hearing Protection Strategy.